

MIKAELYAN, A.L.

Wave guide and coaxial valve systems for waves displaying rotational symmetry. Dokl.AN SSSR 104 no.2:233-236 S '55. (MLRA 9:2)

1.Institut radiotekhniki i elektroniki Akademii nauk SSSR. Predstavleno akademikom V.A.Kotel'nikovym.
(Wave guides)

MIKAYELYAN, A. L., Institute of Radio Techniques and Electronics

"Isolateurs coaxiaux et guides d'ondes dont les parametres varient lentement,"
a paper submitted at the International Congress on Ultra High Frequency Circuits and
Antennas, Paris, France, 21-26 Oct 57.

SO: C-3,800,391

Mikaelyan, A.L.

108-10-3/11

AUTHORS: Mikaelyan, A.L., Ordinary Member of the Society; Stolyarov, A.K.

TITLE: Ferrite-Wave-Guard Valves Using Ferromagnetic Resonance (Ferritovyye volnovodnyye ventili s ispol'zovaniyem ferromagnitnogo rezonansa)

PERIODICAL: Radiotekhnika, 1957, Vol. 12, Nr 10, pp. 17 - 30 (USSR)

ABSTRACT: In elaborating concrete valve systems the phenomena of ferromagnetic resonance must be investigated. The basic results of the theoretical and experimental investigation of this phenomenon are given and some data of the elaborated models are listed. First the resonance phenomena in a rectangular wave guide with a cross-magnetic ferrite-plate are investigated. With the qualitative investigation of the valve action the authors show that the least magnetic losses in ferrite are to be found when the structure of the wave propagating in it is linearly independent from the structure characteristic for an ordinary wave. The approximate theory of the resonance valve is given and the formulae deduced in this make it possible to investigate the dependence of the dying-out constants of the direct as well as of the back wave of a number of factors and such to find the conditions

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Ferrite-Wave-Guard Valves Using Ferromagnetic Resonance

for obtaining a maximal valve effect. The authors show that such a position of the ferrite, where the back (reverse?) losses reach their maximum value exists and they further show that the ferrites destined for resonance schemes must have very low dielectric losses. The experiments show that the theory given here is valid only for very thin ferrite-plates. But as thin ferrite-plates must be used to increase the valve ratio (ratio between back losses and direct losses) the authors show that, if an additional dielectric plate is used (as the first mentioned author showed in his dissertation in 1954) the losses can be greatly increased and the valve properties of the system can be improved. Therefore the use of too thin plates in valves with dielectrics is unrational. Ways for the increase of the width of the band of resonance-valve installations are shown. There are 22 figures and 2 Slavic references.

SUBMITTED: June 26, 1956
ASSOCIATION: Nauchno-tekhnicheskoye obshchestvo radiotekhniki i elektrosvyazi
im. A.S. Popova
AVAILABLE: Library of Congress
Card 2/2

AUTHOR : Mikaelyan, A.L. and Koblov, M.M.

"Application of Ferrites for Coaxial Valve Systems,"
A-U Sci Conf dedicated to "Radio Day," Moscow, 20-25 May 1957

PERIODICAL: Radiotekhnika i Elektronika, Vol. 2, No. 9, pp. 1221-1224,
1957, (USSR)

AUTHOR : Mikaelyan, A.L. and Stolyarov, A.K.

"Ferrite Valves Utilizing Ferromagnetic Resonance,"
A-U Sci Conf dedicated to "Radio Day," Moscow, 20-25 May 1957.

PERIODICAL: Radiotekhnika i Elektronika, Vol. 2, No; 9, pp. 1221-1224,
1957, (USSR)

MIKARLYAN, A.L., red.; GROZNOVA, V.I., red.; MASHAROVA, V.G., red.; KORUZEV,
N.N., tekhn. red.

[Use of ferrites in antenna and waveguide engineering; a collection
of abridged translations from foreign magazines] Nekotorye primene-
niia ferritov v antenno-volnovodnoi tekhnike; sbornik sokrashchennykh
perevodov iz inostrannykh zhurnalov. Moskva, Izd-vo "Sovetskoe radio,"
1958. 253 p. (MIRA 11:7)
(Ferrites) (Wave guides) (Antennas (Electronics))

SOV/109-3-7-13/23

AUTHOR: Mikaelyan, A. L.

TITLE: A New Method of Measurement of the Permittivity and Permeability of Ferrites (Novyy metod izmereniya dielektricheskoy i magnitnoy pronitsayemostey ferritov)

PERIODICAL: Radiotekhnika i elektronika, 1950, Vol 5, Nr 7, pp 957-958 (USSR)

ABSTRACT: In the method proposed the measurements are carried out in such a manner that it is possible to calculate the desired quantities without solving a transcendental equation. The method consists of the following. If a plane wave impinges normally on a layer of a material having a thickness d , the reflection coefficient is given by Eq.(1), where r , Z_0 , Z and k are defined by Eqs.(2). The permittivity and permeability can be evaluated from Eq.(3). The reflection coefficient R is measured for two samples whose thicknesses are in the ratio of 1:2; the coefficients are then expressed by Eqs.(4). From this it follows that the parameter r can be found from Eq.(8); alternatively the ratio of Z/Z_0 can be found from Eq.(9). The permeability and permittivity are then simply found from Eqs.(9) and (10). The method was checked experimentally by

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SOV/100-3-7-13/23

A New Method of Measurement of the Permittivity and Permeability of Ferrites

V. N. Vasil'yev and A. V. Vashkovskiy, who showed that the best results were obtained when the thickness of one of the samples is equal to the quarter-wavelength (in waveguide), and that of the second is half as big. The paper contains 1 Soviet reference.

SUBMITTED: January 9, 1958.

1. Ferrites--Magnetic properties
2. Ferrites--Test results
3. Mathematics

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SOV/109-3-11-1/13

AUTHOR: Mikaelyan, A.L.

TITLE: The Problem of the Development of Ferrite Amplifiers
for Ultra-high Frequencies (Problema sozdaniya ferrit-
ovyykh usiliteley na sverkhvysokikh chastotakh)

PERIODICAL: Radiotekhnika i Elektronika, 1958, Vol 3, Nr 11,
pp 1323 - 1347 (USSR)

ABSTRACT: The possibility of obtaining amplification by employing the gyro-magnetic effect in ferrites was first suggested by P. Marie (French patent Nr 560660). A similar proposal was made by the author in 1956 (Author's Certificate Nr 16302). The author pointed out that the effects in magnetised ferrites could be used to produce amplification or frequency changing at microwaves and suggested that such an amplifier should have a low noise level. The problem is treated in detail in the present work. The analysis is done in such a way as to enable the "beginners" in this field to acquire an introductory knowledge relating to gyro-magnetic phenomena. Normally, the gyro-magnetic effects in ferrites are described by:

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$$\frac{d\vec{M}}{dt} = -\gamma \left[\vec{M} \vec{H} \right] + \frac{\alpha}{M} \vec{M} \times \frac{d\vec{M}}{dt} \quad (1)$$

where \vec{M} is the magnetisation, $\gamma = |e|/mc$, m is the mass and e is the charge of an electron, c is the velocity of light and \vec{H} is the effective internal field. In normalised units, Eq(1) can be written as Eq(2). If it is assumed that the magnetising field has the direction of the axis z and the alternating field is polarised in the plane xy , as expressed by Eq(4), the solution of Eq(2) is in the form of Eqs(5) where the various coefficients are expressed by Eqs(6), (7) and (8). On the basis of Eqs(5), the imaginary part of the magnetic susceptibility can be expressed by Eq(11). This quantity determines the losses in the ferrites and is usually measured by means of the ferromagnetic resonance. It is found, however, that the results obtained experimentally Card2/10 and those found by employing Eqs (5) and (11) are not in

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satisfactory agreement and it is therefore concluded that the above simple theory is inadequate. An attempt is made to derive a more accurate equation. It is pointed out that the distribution of the magnetisation in a ferromagnetic material is not uniform, due to the presence of spin waves. These produce additional forces which act on the magnetic moments. The effect can be taken into account by introducing into the equation of motion an equivalent magnetic field component. This can be done by solving the quantum equation for spin motion; the energy operator of the electron system, which takes into account their exchange interaction, is then substituted into the equation. The energy operator is in the form of Eq (14) where S_i is the vector operator of the spin in the i -th atom, while I is the exchange integral. On the basis of the above, the macroscopic equation of motion for the magnetisation can be written in the form of Eq (21) or Eq (22), where H_{ex} is given by Eq (23). It is possible to derive Eq (22) on the basis of the purely classical physics.

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This leads to Eq (30) which is equivalent to Eq (23). Apart from the exchange interaction in a ferromagnetic there exist additional interactions. This can be seen from the energy operator expressed by Eq (31) in which the first component expresses the Zeeman energy and the second component gives the dipole energy of the magnetic interaction. Consequently, the macroscopic equation of motion is in the form of Eq (32). In this, the first component of the righthand side takes into account the exchange interaction, the second component relates to the interaction with the external magnetic field (if this is applied to the sample) and the third component is due to the magnetic interaction of the magnetic moments. The third component can be expressed by Eq (33). If the sample is magnetised uniformly, the third component of Eq (32) should fulfil Eq (34); in the case of a non-uniform magnetisation and finite dimensions of the sample, the components should obey Eq (35). Finally, the equation of motion should take into account the losses in the ferromagnetic (the same as in Eq (1)). The final equation

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(in normalised units) can therefore be written as:

$$\frac{d\vec{m}}{dt} = -\gamma [\vec{m} (\vec{H}_0 + \vec{H}_{BH} + \vec{H}_{pazM})] + \alpha [\vec{m} \times \vec{m}] \quad (36).$$

If the external field has a constant and a variable component, as expressed by Eq (37), the equation of motion can be written as Eq (38), where \vec{H} is expressed by Eq (39). Eq (36) can be used to determine the conditions of free oscillations in ferrites. For this purpose, the last component of Eq (35) is evaluated from Eq (40). If the deviations from the constant magnetisation are comparatively small, the equation of motion can be written as Eq (47). By solving this equation with respect to small variable quantities δm_x and δm_y , the system is described by Eqs (49). From this, the relationship between the frequency of the spin wave and its wave vector is expressed by Eq (50). This can also be written in the

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form of Eq (52). By analysing Eqs (49) and (50), it is found that for this case (small variable deviations), it is possible to neglect the exchange field so that the equation of motion is in the form of Eq (55). This can be used to analyse the case of a spheroid which is magnetised along the axis z by an external, magnetic field H_0 . The solution should be in the form of Eqs (57)

and (58). From these, it follows that the relationship between the spin-wave frequency and the spin-wave vector is expressed by Eq (68). The above results can be used to determine the characteristics of the spin wave in ferrites when subjected to the action of ultra-high frequency fields. The equation of motion to be solved is given by Eq (69), where H is expressed by Eq (70). If the alternating deviations are small, the three components of the magnetic field can be determined from Eqs (74). From these, the deviations δm_x , δm_y and δm_z can be

expressed in terms of Eqs (75) and (76). Therefore, the equation of motion for the component δm_x is expressed

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by Eq (78), in which various parameters are defined by Eqs (79) to (86). It is seen, therefore, that the problem is reduced to the solution of an equation of the second order which is well known in radio engineering. This describes a linear oscillatory circuit, whose natural frequency equals ω_k and whose parameters vary with time.

Such an equivalent circuit is shown in Figure 7. By substituting the values of m_x and m_y from Eqs (5) into Eqs (78), the latter can be written as Eq (87), where the various parameters are defined by Eqs (88) to (98). If in Eq (87) only the terms having a frequency 2ω are taken into account, the equation can be written as Eq (100). From this, it follows that the condition of oscillation of the system at a frequency ω is expressed by Eq (101). This determines the minimum amplitude of the external field necessary to produce oscillations. The threshold of self-excitation is obtained when the condition expressed by Eq (102) is fulfilled. The threshold value of the magnetic field is given by Eq (103), where ω_1

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and ω_{kz} are expressed by Eq (104). If the frequency of the spin waves is $\omega_k = \omega/2$, the equation δm_x is in the form of Eq (108), from which the condition of self-excitation is expressed by Eq (109) and the threshold value of the external magnetic field is given by Eq (110). Eq (110) can be used to determine the threshold value of the field as a function of ω_H for various values of k . Graphs of this type are shown in Figure 8. Similar graphs are given in Figure 9 but here the variable parameter is ω/ω_H . From the above investigation, it is concluded that the generation of ultra-high frequency oscillations by means of ferrites is quite feasible. In practice, an oscillator of this type would be in the form of a resonator containing a piece of ferrite which would be subjected to the action of a constant magnetic field. By means of a separate oscillator in the resonator, a field of frequency ω would be produced; the ferrite should be situated in the place where the magnetic field of these oscillations is a maximum. The field of frequency ω

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The Problem of the Development of Ferrite Amplifiers for Ultra-high Frequencies

provides the external force which modulates the parameters of the ferrite and its magnitude should be higher than the threshold value. Under these conditions, the ferrite would oscillate at a frequency of $\omega/2$ or at ω . In order to separate one of these frequencies, it is necessary to design a suitable resonator, to choose suitable dimensions for the ferrite sample and provide appropriate input and output facilities. The amplifier operating on this principle is shown diagrammatically in Figure 14. This device was constructed and investigated experimentally by M. Weiss (Ref 25), whose results fully confirm the above theory. The author makes acknowledgment to M. L. Ter-Mikaelyan for discussing a number of the problems of this work and to V.I. Zubkov for deriving some of the formulae and for making numerical calculations; the author also thanks S.M. Rytov for a number of valuable remarks.

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The Problem of the Development of Ferrite Amplifiers for Ultra-
high Frequencies

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There are 14 figures and 28 references, 16 of which are
English and 12 Soviet.

SUBMITTED: April 24, 1958

Card 10/10

AUTHORS: Mikaelyan, A.L., Koblova, M.M.

105-13-4-4/12

TITLE: The Use of Ferrites for the Production of Coaxial Valve Systems
(Primeneniye ferritov dlya sozdaniya koaksial'nykh ventil'nykh sistem)

PERIODICAL: Radiotekhnika, 1958, Vol 13, Nr 4, pp 30-35 (USSR)

ABSTRACT: The problem of using ferrites for the production of coaxial systems is investigated. First, the conditions for the production of non-reciprocal phenomena in a coaxial conduction are dealt with. The existence of non-reciprocal phenomena in the case of coaxial conduction with a ferrite- and a dielectric plate is explained. The occurrence of such phenomena is shown by the approximation of such a system in form of a strip-shaped tubular conductor the planes of which are rolled up along the x-axis. The equation (1) for the propagation constant γ_y of the direct wave is written down. The parameters of the magnetized ferrite are determined by the tensor of magnetic permeability. According to this equation the propagation constants of direct- and reversing waves as well as their difference which characterizes the non-reciprocal effect is calculated

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The Use of Ferrites for the Production of
Coaxial Valve Systems

100-13-1-1/11

for various thicknesses and parameters of the dielectricum and of the ferrite. The results obtained by these calculations (which are not given here) show that, in the case of given parameters for the plates for the purpose of conserving the maximum non reciprocal effect there is an optimum relation between the width of the ferrite plate and that of the dielectric plate. Non-reciprocal dying-down in a transversally magnetized ferrite-dielectric plate, which was located in the coaxial conduction, was investigated experimentally in dependence on the size and the transmissivity of the dielectric and the ferrite at a wave length of 10 cm. Besides, the non-reciprocal phase shifts were investigated for the purpose of producing coaxial phase-valves of the type of similar tubular conductors. The non-reciprocal phase shifts in the ferrites investigated were insignificant. Therefore, only the model of a resonance valve was developed. Its characteristics are given. The valve has a length of 170 mm, the diameter of the inner conductor is 7 mm, that of the exterior conductor 16 mm. The thickness of the ferrite is 3 mm, that of the dielectric 8.6 mm. The height is an optimum and amounts to 4 mm. The weight of the permanent magnet does not exceed 400 g. Within the frequency range of from 9.8 cm to 10.8 cm the losses of the reversing wave are more than 30 db, those

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The Use of Ferrites for the Production of
Coaxial Valve Systems

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of the direct wave are 2 db. The coaxial valve systems described here are destined to be used for decimeter-waves, but they may also be used for long centimeter waves (6-10 cm) if particularly strict demands are made with respect to the dimensions of the system. There are 11 figures and 4 references, 2 of which are Soviet.

SUBMITTED: June 26, 1957

AVAILABLE: Library of Congress

1. Coaxial valve systems—Production 2. Ferrites—Applications

Card 3/3

AUTHOR: Mikaelyan, A. L. SOV/108-13-9-12/26

TITLE: Answer to **M.L. Levin's Letter** (Otvét na pis'mo M.L. Levina)

PERIODICAL: Radiotekhnika, 1958, Vol. 13, Nr 9, pp. 67 - 68 ("SSR)

ABSTRACT: Mikaelyan in principle agrees with the viewpoint of Levin. He points, however, to the fact that the explanation given by Levin alone is not sufficient to explain the contradiction with respect to the possibility of producing a medium with $n < 1$. This is substantiated at an example. Formula (4) for the index of refraction is **derived**. It appears that the index of refraction becomes smaller than unity, if

$$\Delta = \frac{V_r}{V_0} \text{ does not exceed a certain value. This again}$$

is a requirement imposed upon the relation between the volume occupied by the particle

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$\frac{V_r}{V_0}$ and the shape of the spheroid. V_r denotes the volume

Answer to M.L. Levin's Letter

SOV/108-13-9-12/26

occupied by the particles and V_0 the total volume. If the filling-up density

($2 \frac{V_r}{V_0} \ll 1$) is very small, formula (4) yields an index

of refraction which is smaller than unity. Formula (4) can be used only if the distance between the particles is much greater than the maximum linear dimension of the particle. This hypothesis can only be proved if an accurate formula for the determination of the index of refraction of a medium with spheroidal particles **were derived.** . In this formula the interaction of the particles would have to be taken **into account.** This formula would transform into formula (4) in the case of the inter-spheroidal distances exceeding the maximum dimension of the particle. There are 2 references, 2 of which are Soviet.

Card 2/2

ПРОГРАММА РАБОТЫ РАБОЧЕЙ СЕССИИ
ПЛЕНАРНЫЕ ЗАСЕДАНИЯ

8 июня
в 17 часов

Открытие сессии

✓ А. И. Шумин
Внесение фактоскопических актов на рассмотрение, рассмотрение вопросов разногласий между участниками

✓ В. В. Попов *Full text only (in Russian)*
Принятие резолюции о работе сессии и о ее итогах
V.V. Попов

18 июня
(с 10 до 14 часов)

✓ В. И. Софоров
К вопросу о состоянии развития в области техники радиоэлектроники

✓ А. А. Бессонов
Проблема развития техники

✓ А. А. Бессонов
Внесение фактоскопических актов

report submitted for the Centennial Meeting of the Scientific Technological Society of
Radio Engineering and Electrical Communications in. A. G. Popov (VSEI), Moscow,
8-18 June. 1959

MIKAELYANI A L.

12 июня
(с 10 до 16 часов)

А. В. Гаврилов,
Л. А. Остроумов,
Г. М. Фриден

К. Копеев, директор радиотехнической школы и радио
инженерной школы

В. В. Антонов

Июль 1959 года, конференция по радио инженерии
и физике

В. А. Мамон

К. Копеев, директор радиотехнической школы и радио
инженерной школы

В. А. Мамон

А. В. Антонов

Июль 1959 года, конференция по радио инженерии
и физике

13 июня
(с 18 до 22 часов)

А. В. Гаврилов,
А. В. Мамон

Радиотехническая конференция

70

В. В. Копеев

Радиотехническая конференция и радио инженерия
и физика, конференция по радио инженерии и
физике

В. В. Копеев

А. В. Мамон

Июль 1959 года, конференция по радио инженерии
и физике

В. В. Копеев

Радиотехническая конференция

report submitted for the Confidential Meeting of the Scientific Technological Society of
Radio Engineering and Electrical Communications in A. G. Popyov (YK222), Moscow,
8-12 June, 1959

MIKAELYAN A L.

В. А. Бетанов.
А. М. Шестов.
О некоторых аспектах связи на ферритовых
структурах

16 СЕРИИ ФЕРРИТОВЫХ СТРУКТУР СЧ
Руководитель А. А. Микельян

11 июля
(с 10 до 16 часов)

Специальные заседания с группой специалистов

В. М. Рубин.
В. С. Микельян

Присутствуют: начальник группы радиотехнических работ

В. М. Тучков

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В. М. Тучков

В. М. Тучков

В. М. Тучков

А. А. Микельян.
А. М. Шестов.
Некоторые результаты исследования ферритовых
структур

А. С. Тучков
В. М. Тучков

11 июля
(с 16 до 22 часов)

✓ А. А. Микельян.
Соб. В. М. Шестов.
Выводы из исследования ферритовых структур и их
свойств

А. А. Микельян.
А. М. Шестов.
Содержание исследования ферритовых структур

А. А. Микельян.
А. М. Шестов.
1) Ферритовые структуры представляют собой

А. А. Микельян.
А. М. Шестов.
В. М. Тучков

Примечание: ферритовые структуры представляют собой

report submitted for the Confidential Meeting of the Scientific Technological Society of
Radio Engineering and Electrical Communications in. A. S. Popov (VSEKES), Moscow,
8-12 June. 1959

М. А. Маликов
Устройство автоматизированной системы автоматического
управления процессом

(10 страниц)
(с 10 до 22 часов)

Д. И. Бондаренко,
Р. А. Громовский
Известия о работе с использованием элементов
ЛСД

С. Г. Константинов
Получение сигнала с помощью антенны

М. И. Бабков,
М. И. Галкин,
М. И. Галкин,
М. И. Мещеряков

Изучение структуры сигнала с помощью
автоматизированной системы (СА) с помощью антенны
для построения пространственной картины

Г. А. Мухомов,
С. А. Мухомов

Изучение структуры сигнала с помощью
автоматизированной системы (СА) с помощью антенны
для построения пространственной картины

М

11 часов
(с 10 до 16 часов)

Система передачи и приема информации
устройства СВЧ

В. И. Бабков, М. С. Маликов
Изучение структуры сигнала с помощью антенны
устройства СВЧ

В. И. Бабков
Изучение структуры сигнала с помощью антенны
устройства СВЧ

В. И. Бабков,
М. С. Маликов,
М. С. Маликов
Изучение структуры сигнала с помощью антенны
устройства СВЧ

А. Д. Маликов,

М. С. Маликов
Изучение структуры сигнала с помощью антенны
устройства СВЧ

А. С. Мухомов

Изучение структуры сигнала с помощью антенны
устройства СВЧ

М

report submitted for the Centennial Meeting of the Scientific Technological Society of
Radio Engineering and Electrical Communications in A. S. Poyev (VRSIS), Moscow,
8-10 June, 1959

AUTHORS: Mikaelyan, A.L. and Stolyarov, A.K. SOV/109-4-7-2/25

TITLE: Surface Waves in Ferrite Waveguides

PERIODICAL: Radiotekhnika i elektronika, 1959, Vol 4, Nr 7,
pp 1079 - 1093 (USSR)

ABSTRACT: First, three dielectric waveguides are briefly discussed. The properties of these systems are summarised in the table on p 1080. The first system is a dielectric layer (see the top figure in the table). The second system is a waveguide with a dielectric layer and a single side wall; this is illustrated by the middle figure in the table. The third system is in the form of a waveguide whose one wall is covered with a dielectric layer (see the lower figure in the table). Similar systems containing ferrites instead of dielectrics are then analysed. The first ferrite system is illustrated in Figure 1. It is shown that the field components of the H waves for this system are given by Eqs (1), while the formula for the evaluation of the propagation constant is expressed by Eq (2) (see the earlier article of the author - Ref 1).

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SOV/109-4-7-2/25

Surface Waves in Ferrite Waveguides

The equations are employed to represent the characteristics of the system by means of a number of graphs. These are shown in Figures 2-5. Figure 2 represents the propagation constants of the waves propagating along a ferrite layer having a width $x_0/\lambda_0 = 1$ (Figure 1). Figures 3 represent the structure of the field propagating along the ferrite layer. Figure 4 shows the propagation constant for the waves propagating along a layer having a width of $x_0/\lambda_0 = 0.2$. Figure 5 illustrates the dependence of the propagation constants for a lower-type wave on the width of the ferrite layer. Next, a ferrite-filled waveguide with one wall is considered (Figure 6). The expressions for the fields in this waveguide are given by Eq (7), while the propagation constant can be evaluated from Eq (8) (Ref 1). The properties of the waveguide of Figure 6 are illustrated in Figures 7,8,9. Figure 7 illustrates the propagation constant as a function of frequency for a ferrite plate having a thickness $x_0/\lambda_0 = 1$. Figure 8

Card2/4 shows the cut-off effect in the waveguide as a function of

Surface Waves in Ferrite Waveguides

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the width of the ferrite. The propagation constants for a waveguide having a ferrite width $x_0/\lambda_0 = 0.15$ is illustrated in Figure 9. Finally, a standard waveguide, whose one wall is coated with a layer of ferrite, is considered. The expressions for the fields in this system are known and can be represented by Eqs (11). The propagation constants can be evaluated from Eq (12), which describes all the waves which can exist in the system. The properties of this waveguide are illustrated in Figures 11-14. Figure 11 shows the propagation constants for a ferrite plate having a width of $0.2 \lambda_0$. The dependence of the propagation constants on the relative thickness of the ferrite is illustrated in Figure 12; the calculations were made for $\mu_{\perp} = -5.4 \mu_0$. The dependence of the propagation constants on the relative thickness of the ferrite for $\mu_{\perp} = +0.36 \mu_0$ is shown in Figure 13. The phase and group velocities of the

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Surface Waves in Ferrite Waveguides

ferrite surface waves are illustrated in Figure 14. Some experimental work was carried out to corroborate the theoretical results. The experiments were carried out on a rectangular ferrite-filled waveguide and the results are illustrated in Figure 15. This shows the attenuation of the direct (dashed curves) and reversed (solid curves) waves on the magnitude of the external magnetic field for the ferrite plates of various widths. The experiments confirm the possibility of producing a waveguide which would propagate the waves in one direction. There are 15 figures, 1 table and 4 references, of which 3 are English and 1 Soviet.

SUBMITTED: August 7, 1958

Card 4/4

AUTHORS: ^{SOV/109-4-7-14/25} Mikaelyan, A.L. and Shvarts, N.Z.

TITLE: Some Properties of a Ferrite Amplifier for Centimetre Waves

PERIODICAL: Radiotekhnika i elektronika, 1959, Vol 4, Nr 7, pp 1196 - 1197 (USSR)

ABSTRACT: The amplifier which was investigated was first proposed by H. Suhl (Ref 1) and constructed by M. Weiss (Ref 2). The actual oscillator constructed by the authors comprised a waveguide of a reduced cross-section for the "pump" frequency and a quarter-wave strip resonator for the signal frequency; the pumping frequency was twice the signal frequency. A pulse magnetron was used as a source of ^{the} pumping signal. The experimental results obtained with the amplifier are illustrated in Figures 1-4. Figure 1 shows the dependence of the amplification coefficient on the power of the pump source. It is seen that the gain rapidly increases with the pumping-source power. Figure 2 illustrates the dependence of the gain on the magnetic field; it is seen that a resonance effect can be observed; this is accompanied by instability

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SOV/109-4-7-14/25
Some Properties of a Ferrite Amplifier for Centimetre Waves

and leads to the appearance of oscillations. Figure 3 shows the pump-source power required to produce oscillations at various magnetic fields. The oscillation power (at a constant magnetic field), as a function of the pump power, is plotted in Figure 4. Here, a saturation effect is observed, this being due to the non-linear phenomena in the ferrite. There are 4 figures and 5 references, of which 3 are English and 2 Soviet.

SUBMITTED: March 4, 1959

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357

AUTHOR: Mikheyev, A. I.

TITLE: Nonlinear Theory of Ferrite Resonance

PERIODICAL: Radiotekhnika i elektronika, 1988, V. 33, No. 1, pp 46-58 (USSR)

ABSTRACT: The main subject of this study is the application of nonlinear theory to determine the excitation conditions of parametric oscillations, and to determine the amplitudes of oscillations in steady state conditions. The resonance curves for the electromagnetic generator are given. (1) Derivation of equation for stationary amplitudes. A simple case is discussed, where a ferrite sample is placed inside the resonator tuned to frequencies ω_1 and ω_2 . The ferrite sample is placed at a point where the magnetic fields of natural oscillations of the resonator for these frequencies are homogeneous. A strong magnetic field of frequency ω acts on the ferrite. The frequency ω satisfies the ferrimagnetic resonance condition.

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1. The first step is to identify the problem or question that needs to be answered. This involves understanding the context and the specific requirements of the task.

[illegible]

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AUTHORS:

Modeling the effects of the 1997-1998 El Niño on the

TITLE:

Symptoms:

Aug 1991

PERIODICAL:

But the *Journal* is not alone in its criticism. The *Washington Post* and *Washington Times* also have editorialized against the bill, and the *Los Angeles Times* has editorialized in support of the bill.

11. *Chlorophyll *a** and *Chlorophyll *b** were determined by the method of Arar and Collins (1971).

ABSTRACT:

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[[[
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AUTHORS: Mikolajuk, A. L., Stalman, A. K., Kurlav, K. K.

TITLE: [Illegible]

PERIODICAL: [Illegible]

REF: [Illegible]
(1)

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69917

S/109/60/005/05/005/021
E140/E435

9.1300

AUTHORS: Stolyarov, A.K. and Mikaelyan, A.L.

TITLE: The Approximate Theory of Ferrite Resonant Isolators ^{h?}

PERIODICAL: Radiotekhnika i elektronika, 1960, Vol 5, Nr 5,
pp 740-761 (USSR)

ABSTRACT: This paper was presented at the Jubilee Session of the
A.S. Popov Scientific-Technical Radio Engineering and
Electrical Communications Society, June 12, 1959.

An approximate theory valid for thin ferrite plates is developed, clarifying the effects of the auxiliary dielectric layer. Rectangular and strip waveguides are considered. The restriction to thin ferrite plates is due to the use of the quasi-static approximation. The field in the part of the waveguide not filled by the gyrotropic material must be considered unchanged by introduction of the ferrite. The case of the ferrite in the E-plane of a rectangular waveguide has been studied by the present authors (Ref 3) and the present paper reproduces only the basic results. The case of the ferrite plate in the H-plane is then considered in detail. It is

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The Approximate Theory of Ferrite Resonant Isolators

found that the optimum position of a ferrite plate in a waveguide depends on its width h . For wider plates the optimal position is closer to the side wall of the waveguide. The position is independent of ferrite parameters and is a function only of waveguide dimensions and wavelength. This distinguishes the H-system from the E-system, in which the optimum position of the ferrite depends substantially on the ferrite parameters. The maximum isolation ratio obtainable is the same for both types of isolator. For the H-type isolator, the optimum condition is that in which the magnetic field in the ferrite has a left-hand circular polarization. When the ferrite begins to occupy more than 7% of the waveguide wall width, the isolation ratio of the system deteriorates. This is due to the fact that for a wide plate the left-hand circular polarization of the magnetic field exists only at the central point. In resonant isolator systems the following conclusions are drawn:

1. The maximum isolation ratio is independent of the shape of ferrite plate when the quasi-static approximation

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The Approximate Theory of Ferrite Resonant Isolators

is valid; 2. The optimum location of the ferrite in the waveguide depends on its shape and, in the E-plane, on the ferrite parameters. Passing to consideration of the effect of dielectric, the author concludes that the maximum isolation ratio obtainable from a ferrite-dielectric plate is independent of the dielectric constant and cannot exceed the ratio obtained in a waveguide with ferrite without dielectric layer. The role of the dielectric is the stabilization of the field configuration inside the ferrite over a broad band of frequencies but, due to the presence of loss in the dielectric, optimum thickness and dielectric constant of the dielectric exist. The theory neglects a number of phenomena observed with thick ferrite plates not completely filling the waveguide height, such as shift of resonant frequency of the forward wave in comparison with the backward wave, the existence of an optimum height for the E-type ferrite plate etc. There are 27 figures, 2 tables and 3 Soviet references.

SUBMITTED: August 17, 1959

Card 3/3

MIKASLIAN, A.L.; STOLYAROV, A.K.

Resonant ferrite rectifiers. Elektrosviaz' 14 no.8:42-47 Ag '60.
(MIRA 13:9)

(Microwaves)

(Wave guides)

201,30

S/109/60/005/012/028/035
E192/E582

9.4300 (1137,1155,1147)

AUTHORS: Mikaelyan, A.L., Vasil'yev, A.A. and Turkov, Yu.G.

TITLE: Influence of Dielectric Characteristics and Size of Ferrites on the Width of the Resonance Curve

PERIODICAL: Radiotekhnika i elektronika, 1960, Vol.5, No.12, pp. 2055-2056

TEXT: It is known that the half-width ΔH (or $\Delta \omega$) of the resonance curve is a very important parameter in ferrites. The quantity ΔH is principally determined by the magnetic losses in ferrites. However, it is interesting to investigate how ΔH depends on their dielectric parameters. In order to investigate this effect the system shown in the figure is considered. This consists of a cylindrical resonator operating in the E_{n10} -mode and a coaxial longitudinally magnetized ferrite rod. The characteristic equation for this system is in the form (Ref.1)

$$ak_{\perp} \frac{\mu_0}{\mu_{\perp}} \frac{J'_1(ak_1)}{J_1(ak_1)} + \frac{k}{\mu} \frac{\mu_0}{\mu_{\perp}} = ak_0 \frac{C'_1(ak_0)}{C_1(ak_0)} \quad (1)$$

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Influence of Dielectric Characteristics and Size of Ferrites on the Width of the Resonance Curve

where

$$C_1(ak_o) = J_1(ak_o) - \frac{J_1(bk_o)}{N_1(bk_o)} N_1(ak_o)$$

where a and b are radii of the ferrite rod and the resonator, respectively; μ and k are the components of the tensor of the ferrite permittivity, $\mu_{\perp} = (\mu^2 - k^2)/\mu$; $k_{\perp} = \omega \sqrt{\epsilon \mu_{\perp}}$; $k_o = \omega \sqrt{\epsilon_o \mu_o}$.

For the case of thin ferrite rods Eq.(1) can be simplified and the following expression is obtained

$$\omega_M + (2 + \beta)(\omega_o - \omega) = 0 \quad (3)$$

where $\omega_M = 4\pi\gamma M$, $\omega_o = \gamma H_o$. By separating the real and imaginary parts of Eq.(3) an expression for ω'' , which represents the attenuation coefficient of the natural oscillations in ferrite, is obtained. Consequently, the width of the resonance curve is

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Influence of Dielectric Characteristics and Size of Ferrites on the Width of the Resonance Curve

expressed by

$$\Delta H = \frac{\Delta \omega}{\gamma} = - \frac{\omega''}{\gamma} = \frac{\Delta H_0 + (ak'_0)^2 \frac{\epsilon''}{\epsilon_0} \frac{4\pi M}{16}}{1 + \alpha \frac{\omega_M}{4\omega'} (ak'_0)^2} \quad (7)$$

where γ is the Euler constant. A numerical example is considered and it is shown on the basis of Eq.(7) that the width of the resonance curve due to the dielectric losses is about 0.165 Oe, which is quite a significant fraction for the ferrites with a narrow resonance curve. There are 1 figure and 2 references: 1 Soviet and 1 non-Soviet.

SUBMITTED: April 21, 1960

Card 3/10

MIKAE LYAN, A.L. ; STOLYAROV, A.K.

Question on the design of resonant ferrite valves. Elektrosviaz'
14 no.9:42-51 S '60. (MIRA13:9)
(Waveguides)

22899

9,2571 (1147)

S/109/61/006/004/014/025
E140/E135

AUTHORS: Mikaelyan, A. L. and vasil'yev, A.A.

TITLE: The interactions of magnetostatic oscillations in a ferrite sample in the presence of regeneration.
I. Interactions of simple oscillation modes

PERIODICAL: Radiotekhnika i elektronika, Vol. 6, No.4, 1961, pp.623-630

TEXT: The authors consider regeneration at microwave frequencies in a ferrite sphere. In the first part the interaction of simple oscillation modes is investigated and the conditions for their excitation are found. In the second part the interaction of more complicated types of oscillations is considered, the possibility of which was negatived by Ya.A.Monosov (Ref.3: Radiotekhnika i elektronika, 1960, 5, 1-2, 59, 278). Finally, a general formula is derived for the generation threshold. The amplitude of the external field is determined which will generate oscillations. It was found that the critical values of the pumping field do not depend on the magnetisation of the ferrite. There are 4 figures, 1 table and 7 references: 4 Soviet

Card 1/2 2 English

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D201/D303

9,2574

AUTHORS: Mikaelyan, A.L., and Vasilyev, A.A.

TITLE: Interaction of magnetostatic oscillations in a ferrite sample during regeneration. Part II: Conditions of excitation of oscillations in a general case

PERIODICAL: Radiotekhnika i elektronika, v. 6, no. 5, 1961, 789 - 795

TEXT: In the first part of their work (Ref. 1: Vzaimodeystviye magnitostaticeskikh kolebaniy v ferritovom obraztse pri regeneratsii, Ch. I. Vzaimodeystviye Prosteyskh tipov kolebaniy, Radiotekhnika i elektronika, 1961, 6, 4, 623) the authors showed that HF magnetic fields acting on a ferrite, the frequencies of which are related by

$$\omega_1 + \omega_2 = \omega_p \quad (1)$$

[Abstractor's notes: Symbols used not explained, but are presumably

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Interaction of magnetostatic

those used in the first part of this work⁷ result in the interaction of natural "magnetostatic" oscillations in the sample. This assumption has been illustrated by the analysis of interaction between the simple magnetostatic oscillations 2.0.1 - 2.1.0. In the present article the interaction of higher index potentials, namely of the pair 3.0.1 - 3.1.0 is investigated. The excitation of the above pair leads to the following spectrum of potentials at frequencies ω_1 and ω_2

$$\omega_1: 3.0.1; 1.0.0;$$

(2)

$$\omega_2: 3.1.0; 1.1.0.$$

Assuming potentials to have the structure as given by P.S. Fletcher and R.O. Bell (Ref. 2; Ferrimagnetic resonance modes in spheres, J. Appl. Phys. 1959, 30, 5, 687)

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Interaction of magnetostatic ...

$$\begin{aligned}\psi_1 &= A_1 \cdot 30 z \left[-\frac{x^2 + y^2}{2} + \frac{1}{3} \mu_1 z^2 + \frac{a^2(1-\mu_1)}{5} \right], \\ \psi_2 &= A_2 \cdot 20 (x - jy) \left[-\frac{x^2 + y^2}{4} + \mu_2 z^2 + \frac{a^2(1-\mu_2)}{5} \right],\end{aligned}\quad (3)$$

φ_1 and φ_2 are given by

$$\varphi_1 = \frac{40}{3} (\tau_1 + \tau_2^*) \mu_2^* z^3 A_2^*, \quad \varphi_2 = -15 (\tau_2 + \tau_1^*) (x - jy) z^2 A_1^* \quad (4)$$

so that the full potentials are determined by

$$\begin{aligned}\Psi_1^t &= E_1 z + 30 z A_1 \left[-\frac{x^2 + y^2}{2} + \frac{1}{3} \mu_1 z^2 + \frac{a^2(1-\mu_1)}{5} \right] - \frac{40}{3} (\tau_1 + \tau^*) \mu_2^* A_2^* z^3 \\ \Psi_1^r &= D_1 \frac{1}{r^4} P_3^0(\cos \theta) - E_1 \frac{1}{r^4} P_1^0(\cos \theta), \\ \Psi_2^t &= E_2 (x - jy) + 20 (x - jy) A_2 \left[-\frac{x^2 + y^2}{4} + \mu_2 z^2 + \frac{a^2(1-\mu_2)}{5} \right] - \\ &\quad - 15 (\tau_1^* + \tau_2) A_1^* (x - jy) z^2, \\ \Psi_2^r &= D_2 \frac{1}{r^4} P_3^0(\cos \theta) e^{-j\varphi} - E_2 \frac{1}{r^4} P_1^0(\cos \theta) e^{-j\varphi}.\end{aligned}\quad (5)$$

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From the condition of continuity of potentials and of normal components of induction at a_1 and a_2 the system of equations given in (6) follows:

$$1) \left[\mu_1 + \frac{3}{4} + 0,3(\tau_2^2 - \tau_1^2) \right] A_1 = \left[0,2\tau_2 - 0,8\tau_1\mu_2 + \frac{4}{15}(\tau_1 - \tau_2)\mu_2^{-1} \right] A_2$$

$$2) (4\mu_2 k_2 - 4\mu_2^2 + k_2 - 27\mu_2 - 4 + 8\tau_2\mu_2(\tau_1 - \tau_2)) A_2 = -[21\tau_2 + 12\tau_1 + 6\tau_2\mu_1 + 3(\mu_2 - k_2)(\tau_1 - \tau_2)] A_1$$

$$3) \frac{1}{a_2} [(\mu_2 - k_2 + 2)E_2 - \tau_2 E_1] + [16 + 194\mu_2 + 16\mu_2(\mu_2 - k_2) + 8(\mu_2 - k_2) - 40\mu_2\tau_2(\tau_1 + \tau_2)] A_2 - [90\tau_2 - 54\tau_1 + 24\mu_1\tau_2 - 15(\mu_1 - k_2)(\tau_1 - \tau_2)] A_1 = 0$$

$$4) \frac{1}{a_1} [3E_1 - 2\tau_2 E_2] + [30\tau_1(\tau_1 + \tau_2) - 60\mu_1 - 45] A_1 + [12 - 8\mu_2\tau_2 - 36\mu_2\tau_1] A_2 = 0$$

(6)

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As shown in Ref. 2 (Op.cit.) if $m_0 = 0$, the system of Eqs. (6) resolves into 3 independent equations which characterize the resonant oscillations in the ferrite

$$\begin{aligned} 1) \mu_1 &= -\frac{3}{4}, \\ 2) k_2^2 - 27\mu_2^2 - 4\mu_2^2 + 4\mu_2^2 k_2^2 - 4 &= 0, \\ 3) \mu_2^2 - k_2^2 - 2 &= 0. \end{aligned} \quad (7)$$

and eliminating amplitudes A_1 and A_2 from 7-1 and 7-2,

$$\begin{aligned} \left[\mu_1 + \frac{1}{4} - 0.3(\tau_2^2 - \tau_1^2) \right] [4\mu_2^2 k_2^2 - 4\mu_2^2 - k_2^2 - 27\mu_2^2 - 4 + \\ + 8\tau_2^2 \mu_2^2 (\tau_1 + \tau_2)] = [0.8\tau_1 \mu_2^2 - 0.2\tau_2^2 - \frac{4}{15} \mu_2^2 (\tau_1 + \tau_2)] [21\tau_2^2 + \\ + 12\tau_1 + 6\tau_2 \mu_1 + 3(\mu_2^2 - k_2^2)(\tau_1 + \tau_2)]. \end{aligned} \quad (8)$$

is obtained. The critical value of the modulation depth in ferrite, corresponding to the full compensation of losses can be derived

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from Eq. (8) as

$$m_0 = \frac{2 \sqrt{\mu_1 [\mu_2 + 0.1(\mu_2 - k_2)(4\mu_2 + 1)^2]}}{2\mu_2(\mu_1 - k_1 - 1) + (0.8\mu_2 - 0.3)(\mu_2 - k_2 - 1)} \quad (9)$$

Graphs are given of working frequencies, pumping frequencies and of the external threshold pumping field as functions of the external magnetic field. The same graphs for small values of the magnetic field are also shown. The threshold value of the field of resonant pumping is given as

$$h_p \approx 5 \sqrt{\frac{\Delta H_1 \Delta H_2}{4 \pi M} \Delta H_p} \quad (10)$$

The dependence of the threshold value of the external pumping field and working frequencies for modes 3.0.1 - 3.1.1 are given in Fig. 3. The determination of threshold values of the external pumping field

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From Maxwell's equations

$$\frac{\Delta\omega_1}{\omega_1} = -2\pi \frac{\int_V (\vec{M}_1 \vec{H}_1^{*0} - \vec{M}_1^{*0} \vec{H}_1) dv}{\int_V \vec{H}_1 \vec{H}_1^{*0} dv + 4\pi \int_V \vec{M}_1^{*0} \vec{H}_1 dv} \quad (11)$$

is obtained, where \vec{M}_1^0, \vec{H}_1^0 is the initial magnetizing force and the field respectively, \vec{M}_1, \vec{H}_1 , the magnetizing force and the field induced by losses and pumping, V_1 and V_0 - the volume of the ferrite and total volume respectively; then

$$\Delta\omega_1 = \omega_1 - \omega_2 = \omega_1 - \omega_2 + j\omega_1 \quad (12)$$

is true, where ω_1 - initial frequency, ω_2 - the complex induced frequency. Assuming that $\lim_{\omega_1} \frac{\Delta\omega_1}{\omega_1} = 0$ and eliminating the amplitudes

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Interaction of magnetostatic ...

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$$m_0 \geq \frac{2V(\mu_1 I_1 - k_1 N_1)(\mu_2 I_2 - k_2 N_2)}{[(\mu_1 - k_1 - 1)Z_1 + (\mu_2 - k_2 - 1)Z_2]} \quad (13)$$

is obtained in which I, N, Z are the following integrals

$$\begin{aligned} I_1 &= \int_{V_1} \left(\frac{\partial \psi_1}{\partial x} \frac{\partial \psi_1}{\partial x} + \frac{\partial \psi_1}{\partial y} \frac{\partial \psi_1}{\partial y} \right) dv, \\ N_1 &= \left| \int_{V_1} \left(\frac{\partial \psi_1}{\partial x} \frac{\partial \psi_1}{\partial y} - \frac{\partial \psi_1}{\partial y} \frac{\partial \psi_1}{\partial x} \right) dv \right|, \\ Z_1 &= \int_{V_1} \frac{\partial \psi_1}{\partial z} \left(\frac{\partial \psi_1}{\partial x} - j \frac{\partial \psi_1}{\partial y} \right) dv. \end{aligned} \quad (14)$$

In expression (14) I and N, represent orthogonal magnetic potentials and the integral Z, characterizes the relationship between the oscillation modes in the ferrite. For the pair 3.2.0 - 3.1.0 the

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Interaction of magnetostatic ...

threshold is given in the form of

$$m_0 > \frac{2\sqrt{[2\mu_1 + 0.2(\mu_1 - k_1)(4\mu_1 + 1)^2(\mu_2 - k_2)]}}{k_1 - 15\mu_1 + 1} \quad (19)$$

the graph of which is also given in the article. The following conclusions are made by the authors: 1) The interaction of magnetostatic oscillations resulting from regeneration is possible only for oscillations with a definite structure of the field; 2) With the influence of the pump field at the higher types of resonance with frequencies ω_1 and ω_2 , the whole spectrum of simpler modes arises, the indices of which are determined by formulae (17) and (15) of Ref. 1 (Op.cit.); 3) The threshold value of the external pump field which corresponds to the regenerative mode in the range 5,000 - 8,000 Mc/s has the value of a few oersted and increases with the increase in oscillation frequency. Last, the work of H. Suhl (Ref. 3: Theory of the ferromagnetic microwave amplifier, J. Appl. Phys. 1957, 28, 11, 1225) and of Ya. A. Monosov (Ref. 4: K. Teorii neli-

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Interaction: $\chi^2 = 1.0$, $df = 1$, $p = .32$

neyn, kn yavleniyu i tsele'nyam [1].
elektronizatsiya [2], [3].
Suhl for the theory of the
the present article [4] it is shown that the
of Ref. 4 (Op. cit.) the value of the
duction resulted in $\alpha = 0.7$. In the case of
- 2.1°C. the value of α is equal to 0.

factor $\sqrt{\omega^2 + \omega_p^2}$ (where ω_p is the plasma frequency, $\omega_p^2 = 4\pi n e^2/m$, $n = 2.0 \times 10^{21}$ cm⁻³, which means $\omega_p = 1.1 \times 10^{11}$ sec⁻¹, or $\omega_p = 4.7$ Mc or 700 gauss). The value of ω_p is not given, since it is not known that the interaction between the electron gas and the ion lattice is not negligible. In this work the interaction between the electron gas and the ion lattice is neglected, which leads to a lower threshold for the excitation of the particular problem is that the interaction between the electron gas and the ion lattice is neglected in the case

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Interaction of magnetic field

of a degenerate medium. In a paper by D'yachenko, a student at VPI, the author derives several formulae and numerical evaluations for the interaction of a magnetic field and a degenerate medium. The author also references 2 Soviet-language papers and 1 English-language paper. The author is P.S. D'yachenko, H.O. Bell, Ferri-Gunnell, Research, J. Appl. Phys. 1959, 30, 9, 681; H. Suhl, Theory of the degenerate medium as a wave amplifier, J. Appl. Phys. 1959, 30, 9, 681.

SUBMITTED: April 1959

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9,2571

S/109/61/006/005/026/C27
D201/D303

AUTHORS: Mikaelyan, A.L., Vasil'yev, A.A., and D'yachenko, V.V.

TITLE: Regeneration in ferrite at SHF under the influence of longitudinal pumping

PERIODICAL: Radiotekhnika i elektronika, v. 6, no. 5, 1961,
846 - 849

TEXT: In their previous work (Ref. 1: Vzaimodeystviye magnitostaticeskikh kolebaniy v ferritovom obraztse pri regeneratsii, Ch. I - II, Radiotekhnika i elektronika, 1961, 6, 4, 5, 639, 789) the authors analyzed the phenomena occurring in a magnetized ferrite under the influence of a circularly polarized varying magnetic field having a large amplitude (i.e. the pumping field). The essence of the above phenomena was first determined by H. Suhl (Ref. 2: Theory of ferromagnetic microwave amplifier, J. Appl. Phys., 1957, 28, 11, 1225) and their mechanism reduces to the following: if one excites in the ferrite "magnetostatic" oscillations

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S/109/61/006/005/026/027
D201/D303

Regeneration in ferrite ...

at frequencies ω_1 and ω_2 related to each other by

$$\omega_1 + \omega_2 = \omega_p, \quad (1)$$

where ω_p - the pumping field frequency, then losses due to self-oscillations at frequencies ω_1 and ω_2 can be compensated for from the energy of the pumping field and, therefore, the pumping field has the role of a source which produces periodical changes in the properties of ferrite. At certain "threshold" magnitudes of the pumping field, at which the losses are compensated for, there begins the generation of oscillations at frequencies ω_1 and ω_2 . In Ref. 1 (op.cit.) and Ref. 2 (op.cit.) the only case investigated was when the pumping field was homogeneous and was circularly polarized in the plane perpendicular to the magnetizing axis (type 1, 1, 0). In the present article the authors analyze similar effects in a ferrite sphere under the influence of a pumping field h_p ori-

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Regeneration in ferrite ...

ented along the magnetizing field H_0^0 (along the z axis). As in Ref. 1(Op.cit.) a small ferrite sphere is considered, to which the approximations of magnetostatics can be applied. Using the notations of Ref. 1(Op.cit.) and determining the intensity of magnetization from the system of

$$\frac{d\vec{M}}{dt} = -\gamma[\vec{M}\vec{H}], \text{ rot } \vec{H} = 0, \vec{H} = \text{grad } \Psi \quad (2)$$

$$4\pi M_{x_1} = \chi_1 \frac{\partial \psi_1}{\partial x} - jk_1 \frac{\partial \psi_1}{\partial y} - ah_p \frac{\partial \psi_2^*}{\partial x} + j\beta h_p \frac{\partial \psi_2^*}{\partial y}, \quad 4\pi M_{y_1} = \chi_1 \frac{\partial \psi_1}{\partial y} + jk_1 \frac{\partial \psi_1}{\partial x} - ah_p \frac{\partial \psi_2^*}{\partial y} - j\beta h_p \frac{\partial \psi_2^*}{\partial x} \quad (3)$$

are found, where

$$1 = \frac{\omega_0 \omega_M}{\omega_0^2 - \omega_1^2}; \quad (4)$$

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Regeneration in ferrite ...

$$k_1 = -\frac{\omega_1 \omega_M}{\omega_0^2 - \omega_1^2}; \quad \alpha = \frac{\gamma \omega_M (\omega_0^2 - \omega_1 \omega_2)}{2(\omega_0^2 - \omega_1^2)(\omega_0^2 - \omega_2^2)}; \quad \beta = \frac{\gamma \omega_M \omega_0 (\omega_2 - \omega_1)}{2(\omega_0^2 - \omega_1^2)(\omega_2^2 - \omega_1^2)} \quad (4)$$

From the relationship $\text{div } \vec{B} = 0$ and Eqs. (3) the expressions for the potentials of magnetostatic oscillations at frequencies ω_1 and ω_2 are found to be

$$\begin{aligned} \mu_1 \left(\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2} \right) \psi_1 + \frac{\partial^2 \psi_1}{\partial z^2} &= \alpha h_p \left(\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2} \right) \psi_2^*, \quad \mu_2 \left(\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2} \right) \psi_2 + \\ &+ \frac{\partial^2 \psi_2}{\partial z^2} = \alpha h_p \left(\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2} \right) \psi_1^*. \end{aligned} \quad (5)$$

All the intermediate steps are neglected and only the final results

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Regeneration in ferrite ...

are given which determine the type of interacting oscillations and the amplitude at the pumping field corresponding to the threshold of generation: 1) Oscillations with zero second index, i.e.

$$2,0,1; 3,0,1; 4,0,1 \quad (6)$$

interact between themselves which is the so-called "degenerate" case. The formula determining the generation threshold of oscillations 2,0,1 is given in

$$\frac{h_p}{\Delta H} \geq 2 \frac{\omega_0^2 + \omega^2}{\omega_0^2 - \omega^2} = \frac{5}{2} \frac{H_0^e - \frac{4}{3}\pi M}{4\pi M} \left(1 + \frac{\omega^2}{\omega_0^2}\right). \quad (7)$$

Its graph is given in Fig. 1 for different values of the external magnetizing fields. 2) The second group of interacting oscillations consists of pairs of

$$3,1,0-3,1,1 \quad 4,1,0-4,1,1 \quad 4,2,0-4,2,1, \quad (8)$$

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Regeneration in ferrite ...

the formula determining the generation threshold of a lower pair of oscillations 3,1,1-3,1,1 has the form of

$$\frac{h_s}{p} > \frac{(8\mu_1\mu_1^* - 4\mu_1k_1^* - 4k_1\mu_1^* + 27\mu_1^* - k_1^*)(8\mu_1\mu_2^* + 4\mu_2k_2^* + 4\mu_2^*k_2 + 27\mu_2^* + k_2^*)}{[\alpha(4\mu_1 + k_1 - 4\mu_2 + 27) - \beta(4\mu_2 + 1)][\alpha(4\mu_2 + 4k_2 + 4\mu_1 + 27) - \beta(4\mu_1 + 1)]} \quad (9)$$

The evaluation was made for the condition of every oscillation being at resonance, determined from the relationship

$$k_1 - 27\mu_1 - 4\mu_1^2 + 4\mu_1k_1 - 4 = 0, \quad k_2 + 27\mu_2 + 4\mu_2^2 + 4\mu_2k_2 + 4 = 0. \quad (10)$$

These results for the pair 3,1,0 - 3,1,1 are given as graphs in Fig. 2. There are 2 figures and 3 references: 1 Soviet-bloc and 2 non-Soviet-bloc. The references to the English-language publications read as follows: H. Suhl, Theory of ferromagnetic microwaves amplifier, J. Appl. Phys., 1957, 28, 11, 1225; R.T. Denton, A ferromagnetic amplifier using longitudinal pumping, Proc. I.R.E. 1960, 5, 937.

SUBMITTED: June 24, 1960

Card 6/86

24877

S. 109, 61, 006/007/017/010

D201 D116

9.2571 (1163, 1147)

AUTHORS: Mikhaelyan, A.L., Anton'yants, V.Ya., and Turzov, Yu.I.

TITLE: Effects of coupling between the resonator and the ferrite

PERIODICAL: Radiotekhnika i elektronika. v. 8, no. 1, April, 1964 - 1965

DATA systems which can be represented as resonant circuits with magnetized ferrites inside them are often used in electronic engineering. Such systems can be used as ferrite amplifiers, oscillators, and units for tuning of resonators, for measuring the ferrite parameters, etc. In the analysis and design of such systems it is usually assumed that the action of the ferrite is restricted to the possibility of varying the resonant frequency and that the resonator parameters depend on it only for cases when the frequency of ferrite precession resonance differs considerably from the resonant frequency of the cavity itself and when the ferrite exhibits the property of heavy magnetic

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S/109/61/006/ 07/017/021
D262 D'16

Effects of coupling ...

netizing field [Abstractor's note: Not defined], I_f and I_r are determined by

$$I_f = \int_{V_f} \mu_0 [H_{rx}^2 + H_{ry}^2 + (H_{ry}H_{rx}^* - H_{rx}H_{ry}^*)] dv \quad (7)$$

$$I_r = \int_{V_r} (\mu_0 \vec{H} \vec{H}^* + \epsilon_0 \vec{E} \vec{E}^*) dv$$

since the resonator has many resonant frequencies ω_{rn} , the above phenomenon will be observed near any of these frequencies, the degree of coupling between the ferrite and the resonator being determined by the field structure, corresponding to the frequency and type of the wave. Not only the homogeneous precession, but also other types of magneto-static oscillations are shown to be related to the resonant frequencies of resonator. This is shown

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S. 19/61/006/007/017/120
24877/006

Effects of coupling ...

in Fig. 7, in which the resonator frequency is related to one of the higher modes of oscillation of ferrite. The analysis of this phenomenon may be done using

$$\frac{\omega - \omega_r}{\omega_r} = \frac{\int_{V_f} \mu_0 \vec{H} \vec{H}_r^* dv + \int_{V_r} (\epsilon - \epsilon_0) \vec{E} \vec{E}_r^* dv}{\int_{V_r} (\mu_0 \vec{H} \vec{H}_r^* + \epsilon_0 \vec{E} \vec{E}_r^*) dv}, \quad (1)$$

where \vec{H}_r , \vec{E}_r - magnetic and electric fields respectively in empty resonator; \vec{H} and \vec{E} - the respective fields in the resonator excited by ferrite; M - magnetization of ferrite, ϵ - specific inductive capacitance of ferrite; V_f and V_r - the volume of ferrite and of resonator respectively. For a ferrite sample in the shape of an ellipsoid with the symmetry axis, the transverse components of magnetization \vec{M} are related with the external alternating field components H_r by

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S/109, 61/016, 007/017, 100
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Effects of coupling ...

$$M_x = \frac{\chi^e}{\omega_0} H_{rx} - j \frac{k^e}{\omega_0} H_{ry}, \quad M_y = j \frac{k^e}{\omega_0} H_{rx} + \frac{\chi^e}{\omega_0} H_{ry}, \quad (2)$$

where χ^e and k^e are the components of the tensor of "external" susceptibility of ferrite. In using Eq. (1) instead of Eq. (2) for values of P.C. Fletcher and R.L. Bell (ref. 1: Ferrite magnetic resonance modes in spheres, J. Appl. Phys. 1959, Vol. 30, 687) and further to used, relating the magnetization and the field for a given type of oscillation in the ferrite. The resonance curve of the system ferrite resonator in terms of the magnetic field strength, differ considerably from that of ferrite in free space. Indeed, $2\delta H$ depends not only on magnetic losses of ferrite, but also on other parameters of the system. This fact leads to the need for working at frequencies remote from the resonant frequency of the resonator. The evaluation of coupled systems of the ferrite resonator can be also carried out using the method of A.L. Lukatskiy (ref. 2: Kollineynaya teoriya ferritnykh generirov, Radiotekhnika).

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Effects of coupling . . .

S. 109/61/056 107/617/12
Date: 1966

1. elektronika, 1966, 1, 1, 36) and also the interaction between the sample and resonator, the interaction between the (a) and (b) ferrite samples is possible, which can be determined experimentally. The phenomenon observed in the present experiment can be used for setting up various microwave systems. It may be noted that the dependence of frequency on a magnetizing field is most pronounced close to the region where the frequency of ferrimagnetic resonance is near that of the resonator itself, so that a considerable tuning range is possible with only small changes of the magnetizing field. A coupling resonator ferrite system can also be used as a tuned filter, with the frequency band depending on the number of ferrite samples within the resonator. Such a system can also be used as a fast acting switch. The authors acknowledge the help of A.A. Pistol'kors. There are 2 figures and 4 references: 1 Soviet-bloc and 1 non-Soviet-bloc. The reference to the English-language publication reads as follows: P.C. Fletcher, R.C. Bell, Ferrimagnetic resonance modes in spheres, J. Appl. Phys., 1966, 36, 1, 687.

SUBMITTED: July 26, 1966

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9.1900 (1127)

S/108/61/016/011/001/007
D201/D304

AUTHORS: Mikaelyan, A.L. and Stolyarov, A.K.. Members of the
Society

TITLE: A 'cut-off' type ferrite switch

PERIODICAL: Radiotekhnika, v. 16, no. 1 - 17

TEXT: This paper was presented at the Jubilee Session of NTOR and
E im. A.S. Popov, June 14, 1959. In an earlier article, the authors
investigated the properties of a wave propagation in a rectangular
waveguide with a transversely magnetized ferrite layer (Ref. 1:
Radiotekhnika i elektronika, v. 4, no. 7, 1959). In the present ar-
ticle, the authors investigate the independent effects in the cut-
-off waveguide with magnetized ferrite in order to establish the
required conditions for obtaining the type of switch described in
the title. The main problem of analyzing a cut-off waveguide with
ferrite reduces to evaluating losses in the forward and backward di-
rections and to determining their dependence on frequency, ferrite
parameters, transverse dimensions of waveguide etc. The calculati- X

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A 'cut-off' type ferrite switch

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ons are extremely involved and result in solutions of a transcendental equation in the complex plane, a problem difficult even when being solved with an electronic computer [Abstractor's note: The computers calculations were made by Engineer V.I. Anan'yeva]. There is another delicate point in these calculations and that is that the cut-off waves in a waveguide with a ferrite layer, are determined not by the imaginary, but by complex propagation constants even when no losses are present. Calculations have shown that with losses present in the ferrite the energy within the empty portion of the waveguide does not change while the backward energy going through the ferrite is heavily attenuated. Thus, when losses are present, there is in a cut-off waveguide an energy beam in the direction of propagation; this becomes smaller in proportion to the increase in system losses. It follows that if ferrite losses are finite, matching arrangements may be used to tune the system and to dissipate in the ferrite all ingoing power. The losses of the forward wave are related to the magnitude of γ'' (the propagation constant γ_y is complex and equal $\gamma_y = \gamma'_y + i\gamma''_y$) in a linear manner. X

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A 'cut-off' type ferrite switch

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D201/D304

The backward wave, being a cut-off wave is heavily attenuated. When losses are absent the forward wave is shown to be fully reflected from the switch input. But then the forward wave becomes fully reflected from the other end of the switch, since the system then represents a reactive four-pole with equal moduli of a transfer coefficient in both direction. Thus the system cannot operate as a switch with no ferrite losses as it would not be consistent with the law of conservation of energy. When losses are present in the ferrite, the backward wave is fully absorbed in the switch and hence, the forward wave will be propagated with little attenuation. The backward wave may be impelled to go into the switch by using any matching element. The smaller the ferrite losses, the narrower is the matching range. Also, a switch with high back-to-front ratio is obtained for ferrites with small losses. In an actual example which is not optimum, at a wavelength of 3.2 cm the attenuation of the backward wave is 26 db/cm and is practically independent of ferrite losses δ . The forward wave attenuation is 0.35 db/cm at $\delta = 0.01$ and 0.7 db/cm at $\delta = 0.02$. The measurements carried out at the field strength of $H_0 = 2200$ oersted showed that $\beta_{bck} \approx 63$ db, β_{dir}

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A 'cut-off' type ferrite switch

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≈ 6, SWR = 5. The SWR for a cut-off switch is, therefore, rather high. By introducing matching from both ends, ~~the~~ attenuation of forward waves is reduced to $\beta_{co} = 1$ db at SWR = 1.1. Analysis of the effect of the ferrite layer, waveguide dimensions has shown that in evaluating the attenuation of a cut-off type switch in the backward direction, it is enough to take into account the lower cut-off modes of waves. The ferrite surface wave at $\mu_1 < 0$ may propagate with small losses in the waveguide, provided the ferrite thickness is small. The experimental frequency characteristics show a slow decrease in the backward wave attenuation with increasing frequency which is said to be due to the fact that the electric waveguide dimensions increase and these dimensions have been found to affect the attenuation of the backward wave. The attenuation frequency characteristic of the forward wave is increased sharply at both ends due to approaching to the ferrite resonance and to the region of dispersion near $\mu_1 = 0$. Proper choice of the latter can make the working frequency band of the cut-off switch 30 ± 5 %. In general, good agreement has been found between theory and experi-

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29-85

S/108/61/016/011/001/007

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A 'cut-off' type ferrite switch

ments. There are 17 figures and 2 Soviet-bloc references.

ASSOCIATION: Nauchno tekhnicheskoye obshchestvo radiotekhniki i elektrosvyazi im. A.S. Popova (Scientific and Technical Society of Radio Engineering and Electrical Communication im. A.S. Popov) [Abstractor's note: Association taken from 1st page of journal]

SUBMITTED: March 15, 1961

X

Card 5/5

MIKAELIAN, A.L.; VOL'PERT, A.R.; BURDUN, G.D.

All-Union conference of the A.S. Popov Scientific and Technical
Society of Radio and Electronics. Radiotekhnika 16 no. 11:74-78
N '61. (MIRA 14:10)

1. Rukovoditel' seksii ferritovykh ustroystv SVCh Nauchno-
tekhnicheskogo obshchestva radiotekhniki i elektrosvyazi imeni
Popova (for Mikaelian). 2. Rukovoditel' seksii antennykh ustroystv
Nauchno-tekhnicheskogo obshchestva radiotekhniki i elektrosvyazi
imeni Popova (for Vol'pert). 3. Rukovoditel' seksii radioizmereniy
Nauchno-tekhnicheskogo obshchestva radiotekhniki i elektrosvyazi
imeni Popova (for Burdun).
(Radio) (Electronics)

MIKAELIAN, Andrey L.

"Phenomenon of interconnection with magnetized ferrite patterns."

Paper to be presented on RADIO (SCIENTIFIC) UNION, INTERNATIONAL
(URSI) - Symposium on Electromagnetic theory and Antennas - Copenhagen,
Denmark, 25-30 Jun 62

1. Institute of Radio Engineering and Electronics, Academy of
Sciences USSR

8/109/82/007/000/027/029
1234/5502

1117/
AUTHORS: Mikheev, A.A., Smil'gov, A.A., and Smorodint, V.S.

TITLE: Calculation of generation thresholds in ferrites with longitudinal pumping

ABSTRACT: Radiotekhnika i elektronika, v. 7, no. 3, 1962, 568 - 569

NOTE: The authors consider phenomena analogous to regeneration in ferrites, with the aid of the disturbance method. It is supposed that the initial system is a ferrite sample having no losses, with frequencies ω_1 and ω_2 . The disturbances are assumed to consist of losses of oscillations of the frequencies ω_1 and ω_2 and the field of pumping, i.e. the frequencies ω_1 and ω_2 are then complex. A formula is obtained which allows determination of the generation threshold; for the simplest case it is found to coincide with the result of a previous paper by the authors. Quasi-static approximation is used in the deduction. A short mention of experiments carried

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calculating generation thresholds ...

3/10/1961 107/103/103/103
3234/1034

out by the authors for this type of oscillations in the ...
are 6 references: 5 Soviet-biased and 1 non-Soviet-biased. The referen-
ces to the English-language publications read as follows: R. Ben-
ton, Proc. IRE, 1960, 48, 5, 937; L. Walker, Phys. Rev., 1957, 105,
2, 390; R. Benton, J. Appl. Phys. 1961, Suppl., 32, 3, 305.

SUBMITTED: October 14, 1961

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3/109/62/057/054/05/18
0230/0502

1,2571

AUTHORS: Mikaelyan, A.L., and Anton'yants, V.Ya.

TITLE: Mutual coupling phenomena in a system of magnetized ferrite samples

PERIODICAL: Radiotekhnika i elektronika, v. 7, no. 4, 1962, p. 623 - 630

TEXT: This is a discussion of the coupling effect and of the characteristics of ferrite samples under the action of an external microwave field and in a radiated field from the neighboring samples. To determine the resonant frequencies of the coupled system, the cases of the coupling effect were examined, in which the arrangement consisted of two samples each having the form of an ellipsoid. The rotation and placed in free space: 1) The samples lie in plane $\theta = 0$, perpendicular to the direction of the constant magnetic field. In this plane all positions of the second sample become correspondingly the same, hence this sample is placed at points $x = a, y = 0$. Formulae for the resonant frequencies are deduced for samples of finite volumes and finite separations. The losses in the system can
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D230/D302

Mutual coupling phenomena in ...

be calculated from the complex frequency values. The field is calculated along the z-axis at points $z = 0$ and $z = c$. Problems for the calculation of frequencies are discussed and it is shown that in the case of a system consisting of two closely-spaced ferrite samples there is a mutual coupling which can be defined in terms of the coefficient of mutual coupling K , as in a system of coupled networks. The calculation of K and a variety of natural frequencies as a function of the distance c between the ferrite samples is presented in the form of a graph. The problem of the losses is examined in detail. It is shown that the imaginary part of the resonance frequency is determined both by the losses of the ferrite and by the mutual coupling which adds at the frequency and appears at the resonance. It is also shown that the radiation loss can cause a shift in the frequency of the resonance and that these can be several times greater than the thermal losses. This suggests the possibility of using ferrite samples as effective radiators, whose parameters can be controlled by the magnetic field. There are 2 figures and 6 tables. 11 refs. 1 non-Soviet-Russ. SUMMARY: November 1, 1961.

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S/109/62/007/010/011/012
D266/D308

AUTHORS: Mikaelyan, A.L., and Koblova, M.M.
TITLE: Transmission of energy in crossed waveguides with the aid of magnetized ferrites
PERIODICAL: Radiotekhnika i elektronika, v. 7, no. 10, 1962, 1835 - 1838

TEXT: The purpose of the paper is to present a mathematical analysis of a device consisting of two crossed rectangular waveguides, connected with the aid of a small ferrite sphere. In the absence of magnetization there is no coupling between the two waveguides. Applying, however, an axial magnetic field H_0 and choosing the parameters appropriately, a nearly perfect transmission can be achieved. If the dimensions of the ferrite are small the magnetization can be regarded as homogeneous and the ferrite can be replaced by two magnetic wall currents. The electric and magnetic field far from the junction can be obtained from the magnetic current with the aid of L.A. Vaynshteyn's formulas. Assuming ferromagnetic resonance and neglecting thermal losses, the power in both waveguides is calculated and
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Transmission of energy in ...

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D266/D308

the transmission coefficient is obtained in the following form

$$\tau = \left[\frac{2 \left(\frac{4\pi M_0}{2\Delta H} \right) \frac{2\pi V_f}{ab\lambda_B}}{1 + 2 \left(\frac{4\pi M_0}{2\Delta H} \right) \frac{2\pi V_f}{ab\lambda_B}} \right]^2 \quad (16)$$

where M_0 - d.c. polarization, H - linewidth of the magnetic field, V_f - volume of the ferrite, a , b - dimensions of the rectangular waveguides, λ_B - guide wavelength. Several examples are worked out and it is concluded that in practical case $2\Delta H$ should be smaller than 0.5 oersted. There are 4 figures.

SUBMITTED: May 4, 1962

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42730

S/109/62/007/011/009/012
D295/D308

9.2571 (also 4205)

AUTHORS:

Mikaelyan, A.L. and D'yachenko, V.V.

TITLE:

A new type of ferrite magnetostatic amplifier

PERIODICAL:

Radiotekhnika i elektronika, v. 7,
no. 11, 1962, 1966 - 1969

TEXT:

The new type of magnetostatic ferrite amplifier proposed is based on the existence, in a small magnetized ferrite sphere subject to circular pumping, of pairs of interacting long-wave oscillations for which the frequencies add up to twice the pumping frequencies (in the simplest case) and the indices of the magnetostatic potentials $\psi_{n,m,r}$ satisfy the relations $n_1 = n_2$, $m_1 = m_2 + 2$ and $r_1 - r_2 = 0, 1, 2, \dots$

The threshold pumping intensity is evaluated for the coupled modes $2,0 - 2,2$; $3,0 - 3,2$ and $3,1 - 3,3$. The threshold can be considerably lowered by suitably choosing the mistuning

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A new type ...

of uniform precession with the resonator. A plot of the amplitude and frequency of the pumping field as a function of the constant magnetizing field for the $2,0 - 2,2$ pair shows that, in contrast to other amplifier types, the threshold is practically independent of the field for $\lambda = 3$ cm. The main amplifier parameters for a pumping frequency of 9370 Mc/s and $4\pi M_0 = 1700$ G (M_0 is the saturation magnetization) are shown, for various coupled modes, in a table. The table illustrates the fact that the frequency of the oscillations generated differs little from the pumping frequency. The mathematical analysis developed in this brief communication relies on papers by the first author et al. as well as on the well-known papers by H.Suhl and R.L. Walker. There are 1 figure and 1 table.

SUBMITTED: June 15, 1962

* S/109/62/007/011/009/012; S/109/62/007/011/009/012; S/109/62/007/011/009/012

Card 2/2

RABKIN, I.Kh.; MIKAELIAN, A.L.

X-ray diagnosis of combined aortic-mitral defects of the heart.
Vest. rent. 1 rad. 37 no.5:28-31 S-O '62. (MIRA 17:12)

1. Iz kafedry grudnoy khirurgii i anesteziologii (zaveduyushchiy -
prof. Ye.N. Meshalkin) Tsentral'nogo instituta usovershenstvovaniya
vrachey. Adres avtora: Moskva, ulitsa Vostochnaya, korpus 2, kv.85.

MIKAELYAN, A. L.; TURKOV, Yu. G.

"On the Theory of Q-Spoiled LASER,"

"On the Theory of Optical Generators with Accumulating Operation."

Report presented at the 6th Canadian Electronics Conference,
Toronto, Canada, 30 Sep-2 Oct 63.

PHASE I BOOK EXPLOITATION

SOV/6415

Mikayelyan, Andrey Leonovich

Teoriya i primeneniye ferritov na sverkhvysokikh chastotakh
(Theory and Application of Ferrites at Superhigh Frequencies)
Moscow, Gosenergoizdat, 1963. 662 p. Errata slip inserted.
12,000 copies printed.

Ed.: V.N.Shakhgedanov; Tech. Ed.: G.Ye.Larionov.

PURPOSE: This book is intended for scientific and technical personnel working in the fields of shf ferrite devices, solid-state physics, and waveguide technology. It may also be used by advanced students and aspirants specializing in these fields, as well as by technical personnel in related fields.

COVERAGE: The book deals with the problems involving the utilization of ferrites at superhigh frequencies. It discusses electromagnetic phenomena occurring in magnetized ferrites and theoretical and technological problems related to linear ferrite devices which utilize

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Theory and Application (Cont.)

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these phenomena. The book is based on a group effort headed by the author from 1952 to 1960. A.K. Stolyarov, V.Ya. Anton'yants, Ya.A. Monosov, M.M. Koblova, and Yu. G. Turkov comprised the rest of the group. The ferrites used in the experiments described in the book were developed by V.A. Fabrikov, Z.M. Gushchina, and V.D. Kudryavtsev. The author thanks A.A. Pistol'kors, V.I. Zuyev, I.S. Kazbekova, M.T. Novosartov, and A.N. Druzhnikov for their assistance. There are 70 references: 37 Soviet and 33 non-Soviet.

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3. Frequency characteristics of ferrites	22

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L 10262-63 EWA(k)/EWT(1)/EWP(q)/EWT(m)/FBD/BDS/T-2/3W2/EEC(b)-2/ES(t)-2---
 AFPTO/ASD/ESD-3/RADC/AFML---JHB/WH/WJ/IJP(C)/K/EH
 ACCESSION NR: AFJ000555 8/0109/63/008/005/0731/0758

AUTHOR: Mikaelyan, A. L.; Turkov, Yu. G. 74

TITLE: Coherent optical-range oscillators

SOURCE: Radiotekhnika i elektronika, v. 8, no. 5, 1963, 731-758

TOPIC TAGS: laser quantum oscillator 25

ABSTRACT: A review of modern publications (95% of them from USA) on lasers is offered. Principles of operation, resonators, major components, and parameters of the ruby laser are discussed in some detail. The following trends in laser development are noted: 1) increased efficiency and output; 2) increased pulse-repetition frequency; 3) development of very high power short pulses, and 4) development of a continuously operating laser. The high-power energy-storage type of ruby laser is described, as well as lasers based on crystals with uranium and neodymium impurities, those based on other rare-earth elements, and glass-type lasers. Principles of operation, construction, and parameters of the gas laser are also given. Data on various lasers including material, concentration, type of transition, wavelength, is presented in 2 tables. Orig. art. has: 34 equations, 27 figures, and 2 tables.

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MIKAELYAN, A.L.

L 17819-63

BDS

ACCESSION NR: AP3004953

S/0108/63/018/008/0074/0080

AUTHOR: none

TITLE: Nineteenth All-Union Session of NTORIE im. A. S. Popov (see "Association") Celebrating the Day of Radio, closed on 11 May 1963

SOURCE: Radiotekhnika, v. 18, no. 8, 1963, 74-80.

TOPIC TAGS: conference, session, electronics conference, electronics session

ABSTRACT: The Session included 2 plenary meetings and 18 section meetings. There were 272 reports delivered by Soviet and 12 reports delivered by foreign scientists and engineers. The total number of specialists participating in the Session was 1,800, including 25 foreign representatives. Four reports before the first plenary meeting were made by: V. I. Siforov, Corresponding Member of AN SSR and Chairman of the NTORIE Central Board, on the laws of development of natural sciences and electronics; Academician A. L. Mints on toroidal

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ACCESSION NR: AP3004953

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electron accelerators; Professor G. V. Braude on the 25th anniversary of Soviet TV; and a French engineer, A. Aysberg, on international publications in radio and electronics. Two reports before the closing plenary meetings were made by: M. L. By*khovskiy, Doctor of technical sciences, on the use of cybernetics in medical diagnoses, and L. P. Kravzmer, Candidate of technical sciences, on the problems of storing information in cybernetical systems. The Section of Theory of Information, under B. R. Levin, heard and discussed 22 reports on coding theory, signal synthesis, increasing the reliability of information, detecting and isolating signals from noise background, noise immunity of reception, correlation analysis, statistics in electronic channels, and accuracy of reliability prognoses. Those participating in the Section work were: L. M. Fink, Yu. S. Lezin, Yu. L. Zorokhovich, Yu. M. Marty*noy, L. M. Mashbits, L. D. Kislyuk, G. A. Shastova, V. T. Goryainov, V. I. Tikhonov, P. V. Mazurin, I. A. Tsikin, N. P. Khvorostenko, D. D. Kloviskiy, Yu. I. Samoylenko, A. A. Zyuzin-Zinchenko, V. N. Teterev, A. A. Pirogov, M. A. Sapozhkov, I. T. Turbovich, G. I. Tsemmel, O. A. Petrov, Yu. G. Pollyak, G. V. Maly*shev, G. A. Ball, A. S.

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Shvyagin, S. F. Simovskaya, I. V. Sukharevskiy, A. I. Velichkin, V. S.
Borodin, Dr. D. A. Haffman (Lincoln Laboratory, MIT), A. I. Alekseyev, B. E.
Gurfinkel, A. F. Terpugov, A. F. Fomin, and V. S. Bleykhman. The Section
of Cybernetics, under B. S. Fleyshman, dealt with reports on the theory of
systems, investigation of operations, and recognition of patterns. Participating
were: V. M. Bereshtnov, B. V. Gnedenko, G. P. Basharin, V. V. Rykov, A. A.
Vdovin, A. O. Kravitskiy, A. Ye. Basharinov, N. I. Ananov, K. P. Kirdyashev,
A. L. Lunts, V. L. Brailovskiy, V. A. Kondrat'yeva, N. S. Misyuk, N. A.
Lepeshinskaya, O. A. Liskovets, and A. S. Mastykin. The Section of SHF
Ferrite Devices, under A. L. Mikaelyan, had a report on new waveguide-ferrite
devices by A. L. Mikaelyan and M. M. Koblova; a report on a circular waveguide
with a longitudinally-magnetized bar by G. I. Veselov; a report on cross-shaped
circulators by A. K. Stolyarov, I. P. Tyukov, and V. M. Oranzhereyev; and a
report on $(0.9-10) \times 10^5$ -cps coaxial valve by K. G. Gudkov. The Section of
Semiconductor Devices, under Ye. I. Gal'perin, carried reports on tunnel diodes
and transistors in pulsed and rf circuits. Participating were: Kochish Miklosh

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(Hungary). T. M. Agakhanyan, Ladislav Gavlik (Praha), V. N. Konstantinovskiy,
S. A. Savel'yev, O. A. Chelnokov, I. N. Pusty'nskiy, V. A. Shalimov, V. V.
Klimov, N. A. Netsvetaylov, Yu. I. Vorontsov, I. V. Polyakov, V. V.
Kukushkin, N. A. Khokhlachev, K. F. Berkovskaya, V. L. Kreytser, V. A.
Il'in, Yu. V. Koval'chuk-Ivanyuk, I. G. Nekrashevich, V. I. Loyko, I. F.
Savitskaya, D. A. Taumin, L. A. Zubritskiy, G. P. Chursin, G. V. Bagrov,
Ye. G. Belen'kov, and V. V. Horzenko. Orig. art. has: no figure, formula, or
 table.

ASSOCIATION: Nauchno-tekhnicheskoye obshchestvo radiotekhniki i
 elektrosvyazi (Scientific and Technical Society of Radio Engineering and
 Electrocommunication)

SUBMITTED: 00

DATE ACQ: 06Sep63

ENCL: 00

SUB CODE: GE

NO REF SOV: 000

OTHER: 000

Card 4/4

ACCESSION NR: AP4038628

8/0109/64/009/004/0743/0747

AUTHOR: Makarov, A. L.; Turkov, Yu. G.

TITLE: Contribution to the theory of a laser operating in the accumulation mode

SOURCE: Radiotekhnika i elektronika, v. 9, no. 4, 1964, 743-747

TOPIC TAGS: variable Q laser, accumulation mode laser, resonator time constant, population level difference

ABSTRACT: Equations are derived for the resonator time constant, the number of quanta in the resonator at one operating mode, and the difference in level population for a laser in which the Q is made adjustable to accumulate active atoms of the medium at a metastable level during the pumping process. The calculations are made by regarding the laser as an idealized two-level system, and show that the leading front of the laser spike is inversely proportional to a parameter that characterizes the rate of change of the Q (see Fig. 1 of Enclosure). When the Q of the laser noticeably exceeds the threshold level at the instant of the spike, the spike duration depends little on the Q switching rate. If the threshold level is only slightly exceeded, the dependence becomes strong. If the Q

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is turned on slowly, the laser output consists of a sequence of individual pulses. More rigorous calculation must take account of the multimode character of the laser and the variation of the line shape during the emission. Orig. art. has: 6 figures and 10 formulas.

ASSOCIATION: none

SUBMITTED: 03Sep63

ENCL: 01

SUB CODE: EC

NO REF SOV: 002

OTHER: 002

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